AUDECIBEL

OCTOBER 1955

In this issue

Part II, Industrial Noise And Human Hearing
by Martin Hirschorn

Our Speech and Hearing Service
by Honora B. Foster

Technical Developments of Hearing Aids
by Stanley K. Webster

JOURNAL OF THE SOCIETY OF HEARING AID AUDIOLOGISTS

SOCIETY OF HEARING AID AUDIOLOGISTS
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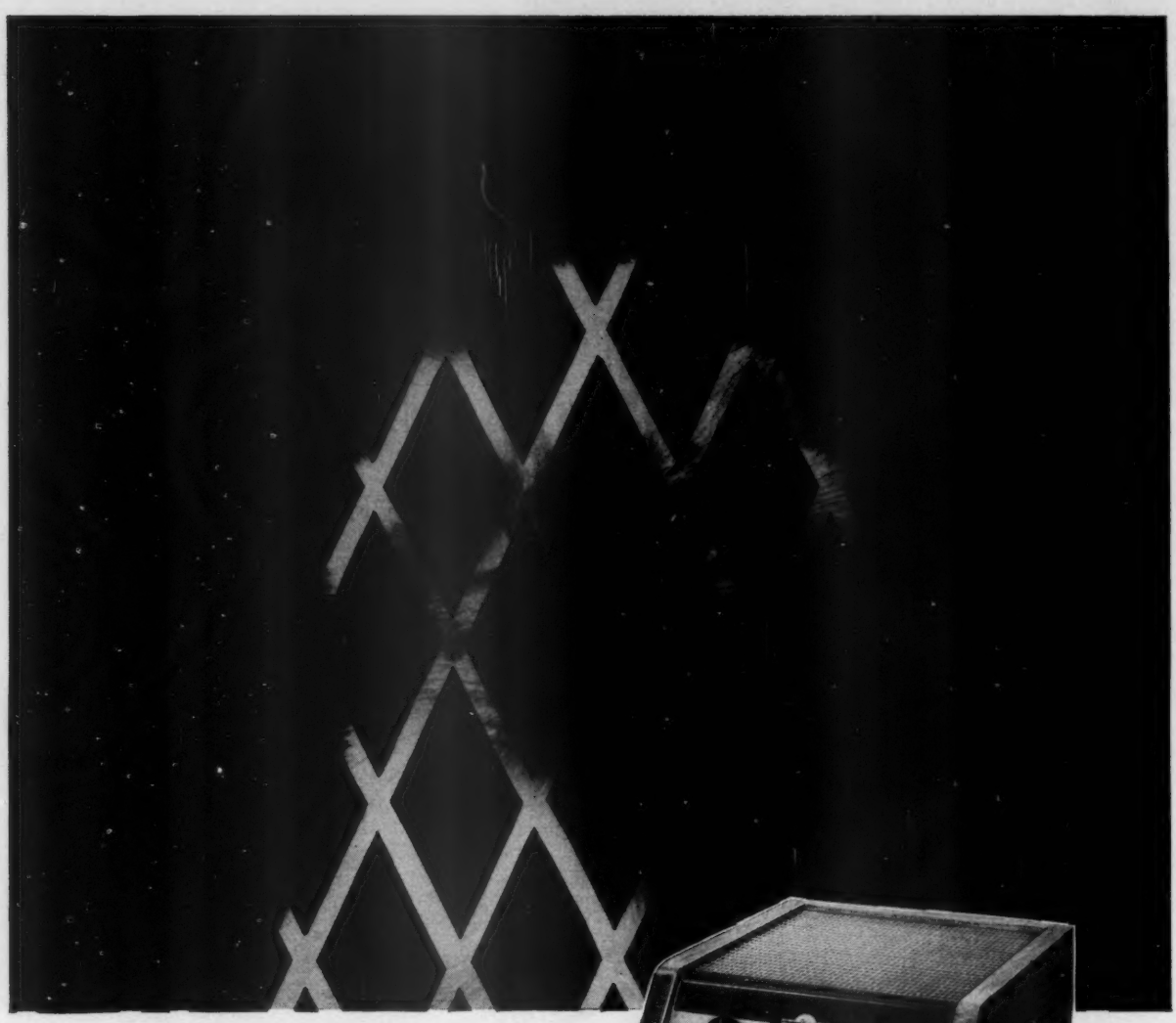

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THE PURPOSE: AUDECIBEL is strictly an educational and professional journal, the purpose of which is to bring to the otologist, the hearing aid audiologist, and others interested in the field of hearing and audiology, authoritative articles, papers and data concerned with research, techniques, education and new developments in the field of treating and assisting the hard of hearing.

THE GOAL: The Society of Hearing Aid Audiologists is dedicated to the goal of reaching and maintaining the highest possible ethical standards in the field of hearing aid audiology. AUDECIBEL is dedicated to the goal of rapport among all those concerned with the hard of hearing so that mutual and overlapping problems may be recognized and outstanding ideas, skills and experiences be shared for the greater benefit of all. You are urged to write in for details of how YOU may participate in and benefit by this worthwhile endeavor.

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THE 450 has 1.3 volts and is packaged four in a clear plastic tube—10 tubes *in a colorful display carton.*

THE 152 has 2.6 volts. It is made up of 2 cells joined by General's exclusive *surge-weld* process which offers positive contact for stable current which will provide better performance for the aid you sell. General 152 Mercury cells are packaged two in a tube—10 tubes in a carton.

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Be ready to cash in on the profit opportunities in the General Mercury Line.

Thornton Zanolli
Editorial Director

Now Hear This...

There is concern on the part of some in the hearing aid industry over the loss of revenue from the sale of batteries as transistor hearing aids replace vacuum-tube hearing aids. Others insist that increased acceptance of the ultra-small, transistor hearing aids has caused the expected loss of revenue to disappear as sales of new hearing aids increased and more than made up the loss.

Among those who have not been able to make up the loss from the sale of new transistor hearing aids there are some who are contemplating turning to the sale of other products as side lines, some who have already done so.

There were those among us who greeted the sudden dawning of the transistor hearing aid era as a mixed blessing. They made rather dire predictions about how transistor hearing aids, requiring practically no power at all, would shortly eliminate the sale of batteries—or so greatly reduce the number sold—that our business would be destroyed. There was even talk about transistor hearing aids with a built-in battery that would last the life of the hearing aid. Furthermore, we were led to believe that the transistor hearing aid itself would operate indefinitely with almost no repair, so that subsequent new models would be bought by only those among the hard of hearing who did not already have a "lifetime" hearing aid.

The bitter irony of this logic forced many in our industry to don a mask to hide the fears in their souls as they sold their first transistor hearing aids, certain that they were selling themselves out of business. Some even tried to postpone the inevitable by rationalizing themselves into believing that transistor hearing aids were no good, and they refused to make them or sell them. Others temporized with "hybrid" hearing aids. Most of us, however, immediately took up with confidence the challenge of this great change.

Our confidence has been amply rewarded. Many of the dark auguries proved false, or only partly true. The hard of hearing wanted smaller transistor hearing aids. Smaller hearing aids necessitated even smaller batteries. Smaller batteries have to be replaced more frequently, and battery sales, at least for established offices,

(See NOW HEAR THIS on page 13)

Part II . . .

Industrial NOISE *and* HUMAN HEARING

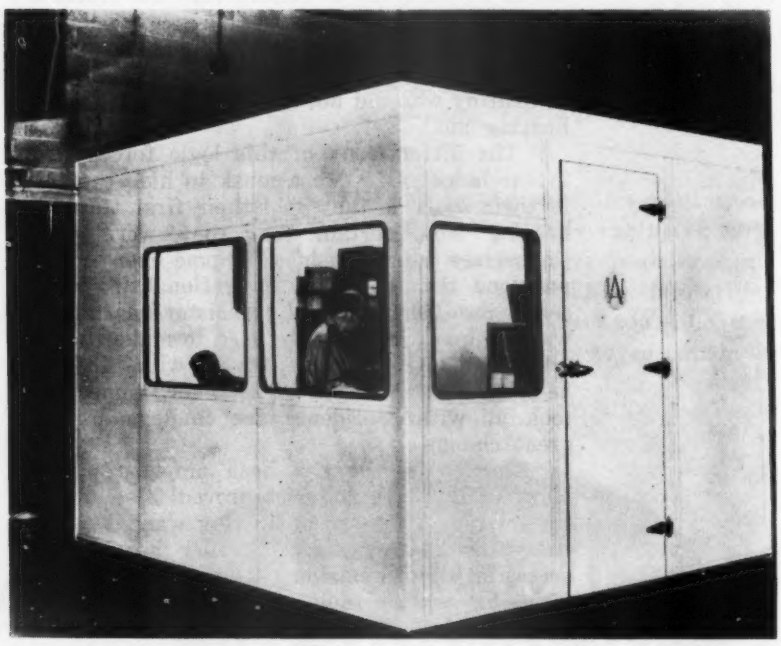
by MARTIN HIRSCHORN
President, Industrial Acoustics Co., Inc.

Mr. Hirschorn discusses technical aspects of sound and methods of decreasing noise.

In discussing the subject of acoustics it is proper to begin with defining the nature of sound.

Sound is a physical disturbance consisting of vibrations and waves generally transmitted through the air to the human ear. Sound will not travel through a vacuum. In order to transmit sound a medium is required having properties of inertia and elasticity. Thus, sound can be transmitted through a gas, liquid or solid material. The diaphragm of a loudspeaker, a plucked violin string or a struck tuning fork illustrate very well the mechanism which causes sound to be created.

The most elementary type of vibration is that which has a single frequency and is called a simple harmonic motion. Such a vibration characterizes a pure note as, for example, produced by a tuning fork, and its pressure fluctuations can be expressed by a sine curve. However, in practice very few pure tones are encountered and the wave forms are more complex.



I.A.C. "QUIET ROOM"—Designed to provide high noise reduction. Industrial Acoustic Co., Inc.'s new "Quiet Room" is available in many sizes and can be easily erected and dismantled and moved to other locations. It is constructed of I.A.C. standard acoustic panels with highly absorptive inside surfaces with a noise reduction coefficient of 95%.

A sound can be completely described by its frequency and intensity. By frequency we mean the number of vibrations per second the vibrating surface goes through a complete cycle, moving to the right, then to the left and back again. Frequency is expressed in cycles per second.

Audible Frequencies

The audible frequency range with which we are concerned here lies between approximately 16 and 20,000 cycles per second. Below 16 cycles per second we talk about intrasonic or subsonic frequencies. Above 20,000 cycles we refer to ultrasonic frequencies.

The low frequency range is arbitrarily considered to begin with 20 cycles per second upwards, and the middle frequency range can be considered to lie between 400 and 1000 cycles per second. Anything above 1000 cycles per second can be considered a high frequency.

It is useful to bring in the concept of an octave which always represents a doubling of the frequency. Many of us are familiar with the eight octave bands used on most sound analyzing equipment, *i.e.*, 37.5, 75, 150, 300, 600, 1200, 2400, 4800, 9600 cycles, which represent the most important octaves in noise control work.

The frequency of a sound also determines its wavelength which is defined as follows:

(See INDUSTRIAL NOISE on page 20)

Why RADIOEAR is your logical hearing aid recommendation

Recent Radioear national advertising has classified the hearing features to be gained by wearing a Radioear Hearing Aid into four desirable advantages:

1. Carefree Hearing—the carefree operation of Radioear All-Transistor Hearing Aids has been so remarkable that Radioear has now doubled the Guarantee to two full years from the date of purchase.

2. Understandable Hearing—some call it "high fidelity"—some call it "hearing realism"—what is really meant is "understandable hearing." Clear, true-to-life, understandable hearing is the result of Radioear's exclusive methods of tone control.

3. Unequalled Hearing Comfort—with Radioear the fuzziness, crackle and rattle is gone. No blasts of uncontrolled volume . . . no exasperating loss of power. And Radioear's small size and light weight make wearing inconspicuous and comfortable, too.

4. Superb Telephone Hearing—Radioear's patented, built-in Phonemaster® lets the user hear over any phone anywhere—the really difficult things like numbers, initials, unfamiliar names and addresses—easily, without strain or distraction.

Summed up, these proved Radioear advantages bring the most complete answer to the hearing requirements of those with mild or severe hearing impairments. The result is fuller, "life-like" hearing happiness.

For enthusiastic appreciation of your good judgment, recommend Radioear. You need only ask any Radioear user for a confirmation.

Radioear Hearing Aids

"The World's Finest"

Model 830
All-Transistor, All-Magnetic
Radioear Hearing Aid

Radioear Corporation

306 Beverly Road, Pittsburgh 16, Pa.

Our Speech and Hearing Service

By HONORA B. FOSTER
Supervisor of Speech and Hearing Services
Waltham, Mass. Public Schools

This article, reprinted from The Massachusetts Teacher, describes the services available at the Waltham, Mass., school system for the hard of hearing and deaf child.

SPEECH is an important factor in the development of the child. It is the bridge which connects the child with others. Good speech is one of the major objectives in education. Our aim is to integrate speech so thoroughly into the daily program that it becomes a definite part of each learning activity.

As a guide to the classroom teacher to reach this goal, the speech department provides a handbook containing suggestions and sample lessons for the development of effective speech skills for all children. Meetings are held with teachers new to the system to acquaint them with opportunities for speech improvement in the classroom.

Members of the speech department are always available to give a helping hand, when needed, to teachers who are planning general speech programs or who would like further suggestions for, or demonstrations of, speech-improvement techniques.

The child whose speech deviates from the normal to the extent of attracting the attention of the listener requires special speech help beyond that offered in the regular classroom. Recognizing his need, the teacher refers him to the speech correctionist, who assigns the child for therapy to either a homogeneous group or a heterogeneous group according to his individual needs.

Many defects are readily corrected, while others involve a longer period of time and a more comprehensive approach. In the more serious cases, other factors enter, requiring a team approach. This team, according to the extent of the problem, may include a therapist, a teacher, a principal, parents, the school nurse, a school psychologist, and a physician.

Each child having faulty articulation, a voice disorder, a stuttering problem, or poor

(See SPEECH and HEARING on page 10)

OSCILLATOR CHECKS ACOUSTIC OUTPUT — In the above section of the Martin Hearing Aid Company's testing process, known voltages are applied to each receiver and carefully checked to insure that the receiver is held to minimum tolerance. A special testing department under the supervision of the engineering department has been set up for this purpose.

RAYTHEON

the only maker of transistors for hearing aids that is closely identified with the hearing aid industry

Raytheon's knowledge of hearing aid needs and problems is the result of intensive concentration on those needs and problems for over sixteen years — first, to provide better, smaller tubes with lower and lower power requirements — then to pioneer hearing aid *transistors* and get them down to the tiniest size while retaining their high efficiency and reliability. Raytheon has always worked hand in hand with the hearing aid manufacturers to achieve the convenience, economy and dependability that is destined to attain the ultimate objective — hearing aids for everyone who *needs* them.

Raytheon loyalty to the industry and those who serve it has been clearly demonstrated over the years. Raytheon never has been in competition with hearing aid makers — never expects to be.

It pays to standardize on *Raytheon Transistors* just as it has always paid to standardize on Raytheon tubes.

RAYTHEON MANUFACTURING CO.

Semiconductor Division

RAYTHEON®

Excellence in Electronics

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SPEECH AND HEARING

(*Continued from page 8*)

speech due to a cleft palate, cerebral palsy, or a hearing loss meets with the speech therapist when she makes her weekly visit to his school. Through games, speech exercises, stories, and rhymes correlated as far as possible with the grade work, the child is helped to perfect his speech to the best of his ability.

What is thoroughly enjoyed by kindergarteners and primary grade pupils as a listening game consisting of doorbells, whistles, and motorboats is, in reality, a pure tone group audiometer test which is used throughout the entire Waltham (Mass.) school system to test hearing. Children giving an indication of having difficulty in hearing are retested individually. Children then found to have hearing impairments, slight or great, are referred for medical attention.

A visit to the family doctor or the family ear specialist is recommended. In the meantime, the classroom teacher is alerted to the possibility of having a hard-of-hearing child in her classroom. Suggestions are made as to how she can help the child to derive as much benefit as possible from the entire learning situation. The teacher is always conscious that she has a pupil that at present is having difficulty in hearing.

Soon, medical reports of various degrees of hearing impairment come to us through the school nurse who has completed the follow-up. Each hard-of-hearing child requires special educational provisions to complement and supplement the regular school program and to enable him to successfully compete with his normal hearing classmates.

Many times, through medical attention, the hearing has been restored to normal. Slight losses may have been retarded by treatment. In either case, the classroom teacher is informed of the situation, and notations to the effect are made on the cumulative record and health cards to alert school personnnel who will come in contact with the child throughout his school life. If he has a slight degree of loss, teacher-awareness of his problem and preferable seating in the classroom are all that is necessary.

A child with a mild to moderate loss throughout his life is unable to understand a certain amount of speech except when in face-to-face conversation. The functions of the classroom teacher in regard to the child with a loss are now of even greater importance, due to the increased educational problem. Also, during the school day the child is given lessons in lip reading by a speech and hearing therapist. He is taught to use his vision to supplement his loss of hearing.

In training the child to recognize visible clues on the

(See SPEECH and HEARING on page 12)

REPRINTS

- For your customers
- To mail to physicians in your area
- For teachers and others interested in problems of the hard of hearing

Reprints are now available of the article

"MINOR SURGERY FOR OTOSCLEROSIS AND MENIERE'S DISEASE"

by Samuel Rosen, M.D., Associate Otologist, Mt. Sinai Hospital, New York
which appeared in the January/February and March/April, 1954, issues of Audecibel.

These illustrated reprints describe the famous Rosen techniques for Mobilization of the Stapes and Chorda Transtympectomy. They are printed on 60-lb. white offset stock, 8½x11, four pages.

SOCIETY OF HEARING AID AUDIOLOGISTS
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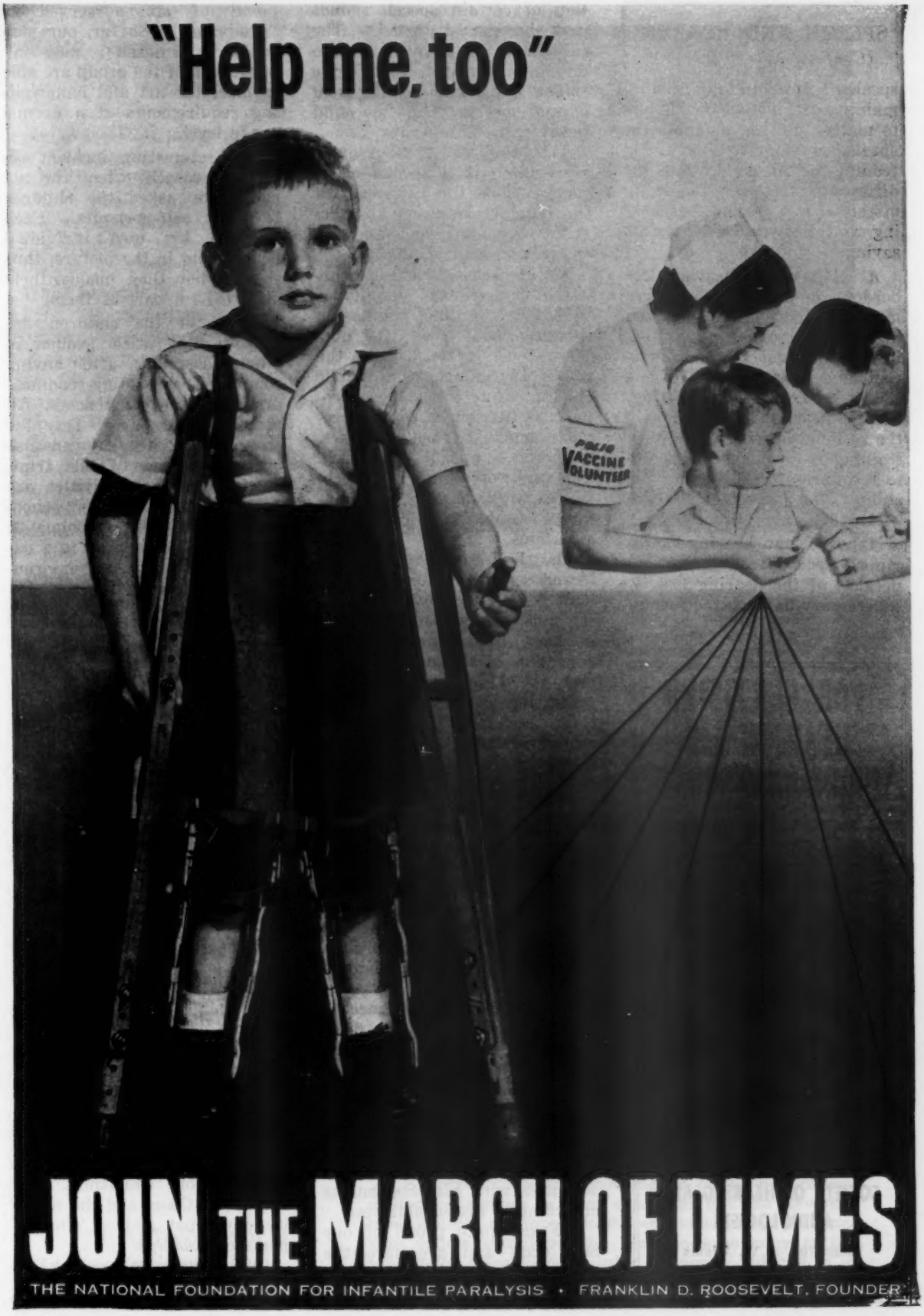
"Help me, too"
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VOLUNTEER
JOIN THE MARCH OF DIMES
THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS • FRANKLIN D. ROOSEVELT, FOUNDER

SPEECH AND HEARING

(*Continued from page 10*)

speaker's face and to use his remaining hearing, we enable him to understand the thoughts the speaker is trying to convey. Lip reading for this child means the difference between knowing merely that a person is speaking and knowing what he is saying.

A child whose hearing loss borders on the severe requires medical attention, the alertness of school personnel, lip-reading instruction, and speech correction, and must, because of his considerable loss of hearing, wear a hearing aid to amplify the residual hearing. Auditory training is given to enable him to recognize, to the best of his ability, the speech he hears with his aid.

Many of our hearing-handicapped need speech correction. Because of the hearing loss, it is necessary to teach the formation of certain speech sounds that become distorted. The child talks as he hears. Also certain hearing losses give speech a different quality from normal speech. Thus the child receives speech therapy.

This child does not require segregation in a special classroom because the techniques of the regular classroom are adequate when supplemented with speech and hearing therapy.

For the severly hard of hearing or deaf child in the city of Waltham, training begins on the pre-school level in a nursery school established by the State Department of Public Health. Here a readiness program is carried on through regular nursery-school activities, with an emphasis on speech. The very beginnings of speech, lip reading, and auditory training are established through play situations.

The child is taught to listen to and recognize sounds through both group and individual hearing aids. Almost of equal importance in our program is the education of the parent to accept the handicap, to understand the needs of the deaf child, and to appreciate the major role played by the home in the growth and development of the whole child.

Upon completion of his nursery-school training, the child is eligible to enter our newly established day class for the deaf. This class meets in one of our largest public schools in a room fully equipped with a group hearing aid. Each child also has his own individual hearing aid.

Here, under the guidance of a trained teacher of the deaf, the child's education follows the course of study prescribed for his normal hearing peers. Only the methods of instruction are different. In this type of situation the child is enabled and encouraged to share classes and activities with his schoolmates according to his capabilities.

We are quite proud of our new class and are sure the reader will not mind if we elaborate on it. The class is composed of six nursery-school "graduates." So far, our plan for these children is materializing. All of the group are able to meet the art and handwriting requirements at a normal grade level.

One interesting incident occurred recently when the art supervisor asked the children to draw self-portraits. Each included his own individual hearing aid in the picture, thus showing how they consider their aids to be a part of them.

Three of the children are now reading with groups in other classrooms, after having completed a reading-readiness program with their teacher. All programs prepared for the other grades are enjoyed also by this class. Field trips, movies, seasonal activities are as much a part of their school life as for their schoolmates. Keeping these children in a natural home and school environment is providing for the normal development of the entire child.

The following letter was recently received at the Medical Center concerning the progress of one of the pupils attending the class:

"Dear Sir: As we agreed when I was at your office in September, I am reporting the progress Thomas has made in the last three months at the Waltham School for the Hard of Hearing.

"We are thrilled! He has so much more poise and self-confidence. School is his whole life.

"He has been through three readers. He can read and count. He can read and tell colors. Although he does not wear his hearing aid at home, he takes it for granted to wear it to school.

"He is keener and so very much more interested in his surroundings. Right now he is excited about Christmas. He has Santa Claus and the nativity down pat and is 'singing' parts of *Rudolph*.

"What more can you ask?"

FOR CERTIFIED HEARING AID AUDIOLOGISTS ONLY

Here is the emblem of your Society — your symbol of Certification as one accomplished in the science of serving, fitting and selling Hearing Aids. Solid gold, ornamented with rich blue enamel.

Lapel Pin (½"x⅝") $5.00 ea.
Cuff Links.....$15.00 pr.
Tie Clasps.....$7.50 ea.

Order Today!

C.O.D. or Enclose Check

SOCIETY OF HEARING AID AUDIOLOGISTS

Room 702, 28 W. Adams

Detroit 26, Mich.

Now Hear This

(*Continued from page 5*)

began to level off about a year ago, or to decline less rapidly. As for the "lifetime" hearing aid that would require no repairs, we now know that it is still a dream of the future, and it may even be atomic-powered!

What about the hearing aid offices that opened their doors after, or just before, the advent of transistor hearing aids? Perhaps it is from these offices we are receiving the expressions of the belief that they must choose, or have already chosen, a side line in order to survive. It really does not matter, however, whether they are new or old offices that make this decision or are now considering it.

What really matters, whenever a hearing aid audiologist is faced with this decision, is that the decision be an honest one. The hearing aid audiologist must arrive at this decision only after enough soul searching and objective analysis of his situation have been made to convince him that he has exhausted all possibilities of increasing the revenue of his hearing aid business. The side line chosen must be suitable, commensurate with the dignity he has built into his business, and one that cannot possibly detract from it or undermine it in any way. The tail must not be incongruous; it must not wag the dog.

What is a suitable side line? There are many that have been offered to us, but are any of them really suitable? Do they really belong in the office of a hearing aid audiologist? We raise these questions seriously to evoke your reactions and your comments for publication in AUDECIBEL. Let us hear from you.

THORNTON ZANOLLI
President, S.H.A.A.

THE music of the world starts slowly. One by one the sounds of day greet you . . . welcome you . . . beg you to join them with a shout . . . a laugh. As they grow louder, they wrap around you and warm you . . .

Can anyone with perfect hearing ever understand the terrible loneliness of not hearing? You're "different". The world is shut off, so you shut it out. Other girls can whisper and tell secrets . . . but not to you. Music can make other feet tap . . . but not yours. A bell can ring and a gate can creak and water can drip . . . but not in your world.

I really can't remember the day people began to mumble and words faded into whispers. When you're in a hurry and busy, a missed word is soon forgotten. Now, I know hearing isn't lost all at once. Mine, I suppose, drifted away unnoticed until suddenly the silence was too loud to ignore.

Eventually, mother and dad knew. It was in their look . . . in the way they'd tense to speak to me. But I had to grow up alone. I guess anyone, young or old, who has lost his hearing *must* grow up alone.

The day I "grew up", I rode in the bus to a hearing-aid dealer. He showed me hearing aids so small they can be worn under the lapel of a coat . . . unseen! Hearing aids as light as a lipstick!

I'd be wrong to tell you I didn't feel strange at first. Was everyone talking about me and staring? No! They were talking *to* me . . . including me in! When you grow up, you discover silence isn't golden . . . hearing is.

This revised version of an advertisement originally sponsored by the makers of "Eveready" batteries is reprinted here as a public service.

DEALER'S NAME
ADDRESS

31-787C ★

The above mat, made available by National Carbon Co., makers of "Eveready" batteries, implements the public relations activities of hearing aid audiologists.

An approach to the disinclination on the part of hard of hearing persons to wear a hearing aid, the advertisement features an appeal to the emotions, but at the same time utilizes straightforward, common-sense copy in presenting the advantages of using a hearing aid and in indicating the connection between the use of such an instrument and emotional maturity—i.e., "growing up."

Advice of Counsel

By
FELIX VISK

COUNSEL was not heard from in the last two issues because of a vacation immediately after the annual meeting in Detroit and an unusually busy summer. Ordinarily, I expect to take it easy while the courts are closed during July and August, but this summer two of the corporation clients of the office decided to do some rather complicated refinancing. Those two jobs left me little time to think about hearing aids or my friends who sell them.

Mr. Visk

During the meeting at Detroit, one of the members brought up the question of how to carry installment paper on one's books. This particular chap had been simply entering the sale as made when the money was collected from the bank to whom he sold the paper. From his comments I take it he was somewhat dismayed when on one occasion the bank called upon him to reimburse them for money advanced on paper which proved to be bad.

I am not a bookkeeper, but from my limited knowledge of that craft, I believe there would be two ways to handle this matter. One would be to set up an installment sales account where the note is sold to a bank, carrying the sale as a contingent liability until such time as the paper is paid off. This method would really amount to keeping books as though you were carrying your own paper.

The second alternative, and probably the most realistic method of handling it, would be to set up a reserve for bad debts. Your experience with installment paper will show the percentage likely to go bad. I rather imagine in the present state of the nation's prosperity, a 10% loss would be large. If you agree, then merely set up an amount equal to 10% of each installment sale in the contingent account so that you would always have a reserve equal to 10% of your outstanding paper to pay for any paper which the bank may demand that you make good.

It certainly should be borne in mind that you may be called upon at any time to pay any of the installment notes which you have previously sold to a banking institution, and you should certainly be in such financial position that you could always take up any of this paper which might be returned to you. It should also be borne in mind that any adverse change in the economy will increase the amount of paper which you will be called upon to pay back.

Two Ways to Endorse

I presume that every dealer realizes that he can endorse his paper to the bank either with recourse or without. If it is endorsed without recourse and the purchaser of the instrument, presuming that the purchaser signed the note, does not pay, the bank's only action is against him. If it is endorsed with recourse, the bank will call upon the endorser, *i.e.*, the dealer, to pay if the maker of the note, *i.e.*, the purchaser of the instrument, fails to pay.

At first glance, it would seem that the logical thing to do would be to endorse the paper without recourse, providing the bank would purchase the paper so endorsed. However, there are other considerations. If the paper is not paid, and endorsed without recourse, the bank will immediately start any action. they can against the maker. They might conceivably repossess the instrument as automobile companies do. They would certainly bring a suit against the purchaser of the instrument in order to collect the money, which might in turn result in a garnishment of the hearing aid user's salary by the bank, or a levy upon his prop-

erty, such as his automobile or his home.

In any event, the bank's collection methods are apt to be stern and severe. Such action on the part of the bank would inevitably reflect upon your own good will. No hearing aid user will understand your position in the matter. If the bank presses them for collection to any great extent, they will resent it, and their resentment will turn upon you who sold them the instrument rather than upon the bank. Most of the time the purchaser of the instrument will not even be aware of the fact that you are in turn selling the paper. Very many such collections could work a great deal of harm to your good will and business.

Bank Calls on You

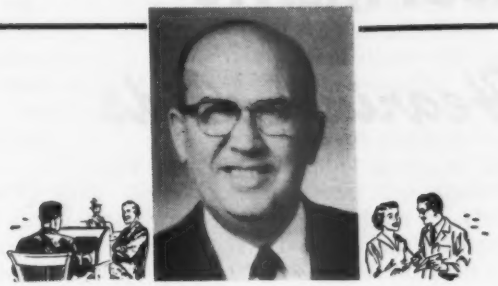
On the other hand, if the paper is endorsed with recourse, the bank will call upon you for payment whenever the hearing aid user fails to pay. In order to make sure of this, it might be well to have an understanding with the bank at the time the paper is sold. In this way, you will be in a position to do your own collecting and use your own methods. True, your own collection efforts may destroy some good will, but at least you will have them under your own control, and if good will is destroyed, it will be more or less deliberate, with a chance to balance the good and evil that may come out of the transaction. If the bank does the collecting, you will have no opportunity of even influencing them as to their methods or procedure.

All of this may be a bit confusing to some of you who have never thought about the consequences of the failure of the purchaser of your paper to collect from the maker of the paper. However, if you will simply view the transaction as similar to one where you endorse someone else's check or someone else's note, the whole matter will become quite clear.

Maico Salutes A Headliner . . .

John L. Murtaugh

OF GRAND RAPIDS, MICHIGAN



JACK MURTAUGH of Grand Rapids, Michigan, is one of the real pioneers of the hearing aid industry as it is known today. He is a veteran of 16 years in the business. . . . . all of them with Maico. . . .and has been Maico's distributor in Grand Rapids for 14 years!

Upon leaving the University of Minnesota, Jack worked for several years in the wholesale grocery and bakery goods business before joining the staff of Maico's distributor in St. Paul, Minnesota, as a salesman. After two years of experience in that capacity, Jack was ready to try his own wings and opened his office at Grand Rapids.

Always active in industry organizations, Murtaugh is a charter member of both I.H.A.A. and S.H.A.A. He currently serves as president of the Michigan hearing aid dealers group. His memberships also include the Masonic Lodge and the Shrine, in both of which he has been very active in committee work.

Jack's 16 years in the business have left him many happy memories, many of which concern satisfactory fitting of children. Of 50 pupils in one school for the deaf in Michigan, 40 have been fitted with Maico's through Jack's efforts. Probably his most spectacular fitting from the standpoint of results, however, was that of a school teacher who had lost his position because of a severe hearing loss. After being fitted with a Maico, the man not only regained his position as teacher but has now advanced to superintendent of schools!

Jack's favorite hobby until he entered the hearing aid business was fishing. Now, what spare time he is able to manage is spent largely with his three grandchildren.

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Maico MEDICAL ACOUSTIC INSTRUMENT CO.

L. A. Watson, President

21 North Third Street Minneapolis 1, Minn.

TECHNICAL DEVELOPMENTS

Of Hearing Aids

By Stanley K. Webster
President,
Stanley Webster Laboratories, Inc.
Chicago, Ill.

In this speech, delivered at the 1955 Annual Meeting of the Society of Hearing Aid Audiologists, Mr. Webster discusses the significance of future developments in hearing aid design.

ALL history records that man's struggle for enlightenment is slow, faltering, and in many instances, haphazard. Development of a social point of view towards deafness has not been an exception to this rule. Only fragmentary bits of information are available prior to the 15th and 16th century. Some of the bits are indirect and inferred, and it is difficult to trace any complete structure of systematic thought. Aristotle and others believed that the deaf were poor educational prospects. The derogatory use of "dumbness" in our modern slang, suggesting an inferior intellect has its roots in the supposed mental incapacity of the deaf. Roman law classified the deaf and dumb with the mentally incompetent.

By the end of the 18th century it had been convincingly demonstrated that the deaf were capable of instruction, and it was also clearly recognized that it was the moral and legal obligation of society to see that instruction was provided. The happy combination of talents brought to bear on the problems of the deaf is best epitomized in the person of Alexander G. Bell. We conciously or otherwise take inspiration and stimulation from his sympathetic understanding; his incisive inquiry and his inventive genius.

We can trace the progress of hearing aid development from the simplest hearing aid used since man became civilized enough to grow old enough to become hard of hearing; the hand cupped behind the ear, thru the ear trumpet, the carbon aid, the electrical vacuum tube aid, and on to our present modern transistor instruments. This development has been at a continually accelerating tempo, and there is no reason I can foresee to indicate a lessening of the rate of acceleration in the foreseeable future.

Recently a whole new field of technology has been born in the science of solid state physics. The transistor has opened new doors in every field of electronics. It has had such terrific impact on the electronic field that scarcely a product on the market today — of an electrical or electronic nature — has escaped the fact that this new technology has made it obsolete. The concept of hearing aid design has changed radically in the past two or three years, and I am frequently asked when and where it will stop. I am a firm believer in the fact that the only limit on what man can achieve is the limitation of what he can imagine. Anything is possible — if the human mind can imagine it.

If progress in technical development continues at the rate it has in the past three years — I am sure we are safe in guessing that three years from now our present designs will be completely obsolete. In three years the cordless invisible instrument — probably concealed entirely in the ear canal, or by other methods of approach — will be a reality.

What will this mean to you members of this society? It will mean an expanding market far beyond your present goals. For every person wearing a hearing aid today, it is claimed there are nine people with some hearing loss. This new tech-

nology will be the open sesame to breaking down the barriers of resistance, which has been your greatest problem.

Eighty-five percent of our overall business volume today — outside the hearing aid field — comes from products that we didn't know about ten years ago. Product development represents one of the few remaining frontiers in today's business world. Horizons are unlimited — opportunities abound.

We as manufacturers recognize a very great responsibility to this society. A responsibility to conduct our development along such lines that we stay within the boundaries of the definition of Engineering. That definition is — "the economical use of time and materials for the *benefit* of people."

We must not — and will not — lose sight of the fact that in the final analysis — it is not a product we are charged with developing — but hearing which we are striving for. Not better *products*, smaller *products*, prettier *products*, but better *hearing* — more *hearing* — and intelligible *hearing*. Obviously the final criterion of hearing aid excellence is the success with which the instrument functions in everyday situations.

The dimensions with which we are dealing are not inches or ounces, but:

(1) Sensitivity or effective gain
(2) Tolerance limit — or psychophysical ceiling
(3) Efficiency in background noise — or signal-to-noise ratio
(4) Discrimination, or efficiency in distinguishing small sound differences

We have new frontiers to explore with these dimensions. Nature provides normal hearing people with two ears. We still must meet, on engineering ground, the practical solution to binaural hearing before we can provide these people who use our products the sense of direction — the feeling of balance — (psychological, if you wish) — and many other benefits enjoyed by we who still have two good ears.

We have thousands of young children who must be reached by a product designed to be practical in the hands of children, and at the same time give them relief from the social stigma their playmates attach to the wearing of the present day aids.

As an engineer — I am most humbly grateful and happy to observe the sincerity of purpose which is the motivating force I feel permeating this society. With principles such as you have evidenced here today; with the conscientious, sincere drive that you have to continually upgrade your profession and expand your knowledge to increase your ability to solve your customers' problems at every level — this society can have no possible future except one of continual growth and success.

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PRODUCTS and PEOPLE is designed to keep you informed on current significant developments in the hearing aid industry and on significant happenings to individuals. Address contributions to PRODUCTS and PEOPLE, AUDECIBEL, P. O. Box 11, Lincoln Park, Mich.

Wayne University Announces Hearing Research Project

Ears of 60 vertebrate and invertebrate animals will be studied as part of a new research project announced recently by Dr. G. H. Scott, dean of the Wayne University College of Medicine.

The study, directed by Dr. Heinrich G. Kobrak, professor of otolaryngological research, is expected to increase understanding of the human ear and its diseases.

Beltone Institute for Hearing Research is financing the project.

Included in the wide gamut of animals to be studied will be the ear of a whale and the hearing mechanism of a cockroach. Other specimens will include fish, reptiles, amphibia, birds and mammals.

The study will inquire into the hearing ability of various animals and pertinent construction differences in animals' ears.

Of special interest will be tests made on animals which developed from water living, such as the whale and water fowl, who adapted themselves to land living and then returned to the water.

Specimens for this study are being obtained from leading institutions and museums across the country.

Both ears of the specimens will be studied. The right ear will be dissected for a histological study, while the left ear will be encased in transparent plastic for direct study.

The Beltone Institute was founded in 1954 by the Beltone Hearing Aid Co. Funds are used for original and independent research in hearing problems.

On the board of trustees, which includes Dr. Kobrak, are: Katherine Barrett, director of the Bureau for the Physically Handicapped Children, Chicago Board of Education; Dr. Raymond T. Carhart, head of the audiology department, Northwestern University; Dr. Howard C. Hardy, assistant manager, physics department, Armour Resarch Foundation; and Sam Posen, president of the Beltone Hearing Aid Co.

TELEX'S "959"
Weight: 1.4 oz.

Telex Announces Model 959

Designed for active people who desire greater freedom of movement than that offered by most hearing aids is the Model 959, a small but powerful 3-transistor aid recently developed by Telex, Inc.

Only 1-1/16" wide, 2¼" long and 9/16" thick, the "959" will deliver up to 55 db gain, with battery life ranging from 100 to 125 hours, according to the manufacturer.

The unit weighs 1.4 oz. and may be worn behind a tie, scarf or lapel as well as in the pocket. The telephone pick-up is built right into the "959," and tone control switch is of the two-position type.

Three different receivers are offered with the unit to best suit the purchaser's hearing loss in regard to high, low or medium frequency reception.

For additional information, write Dept. KP, Telex, Inc., Telex Park, St. Paul 1, Minn.

New Batteries Announced

Two new mercury hearing aid batteries have been introduced by General Dry Batteries, Inc.

Called th "450" and the "152," the batteries deliver 1.3 and 2.6 volts, respectively. Both batteries give 350 milliampere hours of service. The 450 is a single mercury cell and the 152 is a combination of two cells.

Additional information may be obtained by writing the company at 13000 Athens Ave., Cleveland, Ohio.

TV Extension Speaker

No larger than most midget radios, a new "PersonnaTone" TV extension speaker has been introduced by DeRO Electronics, 63 Gilroy Ave., Uniondale, L.I., N.Y.

According to the manufacturer, the speaker can be quickly attached to a TV set and will bring the sound to the listener's elbow, anywhere in the room.

Tonemaster Barrette Model

A new 3-transistor barrette model hearing aid, designed exclusively for women to wear fastened in the hair, has been introduced by Tonemaster Mfg. Co., 128 S. Monroe, Peoria, Ill.

Dimensions of the new model are ¾" wide, ½" thick and 3" long. Weight is ¾ oz. with battery.

WEBSTER'S STEEVES
Exclusive Canadian distributor

Stanley Webster Appoints Two

Stanley Webster, president of Stanley Webster Laboratories, Inc., has announced the appointment of Kenneth Steeves as vice-president and B. E. McDermaid as general sales manager.

Mr. Steeves, of Windsor, Ont., will act as exclusive Canadian distributor for the Webster line. He has had ten years' experience in the distribution of hearing aids and is secretary-treasurer and a member of the governing board of the Society of Hearing Aid Audiologists.

He will leave shortly on a coast-to-coast air tour of Canada to select and appoint new distributors for the Webster Star Line.

Mr. McDermaid is well known to many dealers as the "flying sales manager," having flown his plane all over the U.S. and most of Canada.

Distributor Training Dept. Created by Beltone

Creation of a national distributor training department for the Beltone Hearing Aid Co. has been announced by David H. Barnow, executive vice-president. Edgar C. Buchele, formerly midwest divisional manager for the Alliance Mfg. Co., will be director.

"Mr. Buchele will supervise the training and indoctrination of new Beltone distributors," Mr. Banow said.

He explained that the new department will train new distributors and hearing aid consultants in such areas as office management, advertising, personnel relations, records, and the technical aspects of hearing aid fitting and maintenance.

BELTONE'S BUCHELE
New training supervisor

"College" of Audiometry Agrees to FTC Ruling

The Oklahoma College of Audiometry, of Oklahoma City, charged with misuse of the word "college" by the Federal Trade Commission, will not contest the Commission's ruling, according to its owner, John W. Bridges.

In an article in the Oklahoma City *Times*, Mr. Bridges was reported to have said that he has already made application to have his charter annulled with the Oklahoma Secretary of State.

The FTC had ruled that the correspondence school, which was chartered to sell home study courses in audiometry, is not an accredited college, but a one-man business.

Mr. Bridges, the complaint charges, is not, contrary to representations made in advertising, the holder of a number of degrees in audiometry. The initials M.S. and D.A. after his name stand for master of science and doctor of audiometry. This latter degree, which each student making a grade of 75 or more is supposed to receive, is not known or accepted by reputable schools and is of no validity, according to the FTC. Mr. Bridges, the complaint adds, conferred his D.A. upon himself.

The "college" is not equipped and Mr. Bridges is not qualified to give the latest scientific methods of testing, treating, fitting and rehabilitating those suffering hearing loss, although the advertising claims this is so, the complaint states.

These false claims, the complaint concludes, prejudice the public and constitute unfair trade practices in violation of the FTC act.

In a statement to the Oklahoma City *Times*, Mr. Bridges said, "The charter was taken out five years ago, but I have not been operating for some time. In fact, I don't know why such a ruling was ever made because I have alrady notified them I was asking that my charter be annulled."

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"The QUALITY Earmold Facility"

INDUSTRIAL NOISE

(*Continued from page 6*)

(1)

$l = c/f$

where l = wavelength
c = velocity of sound
f = frequency in cycles per sec.

The velocity of sound is dependent on the temperature and is expressed by the following equation.

(2)

$c = 332(1+t/273)^{1/2}$ m/sec.

The other characteristic of a sound is its intensity or pressure.

The intensity and pressure of a plane or spherical wave having an effective presure of p dynes per centimeter is expressed by the following relationship:

(3)

$$I = \frac{p^2}{107ac} \text{ watts/cm.}$$

where a = density of air in grams per cub. cm.
c = velocity of sound in cm./sec.

This brings us to the concept of the decibel which is defined by the following equations:

(4)

$$db = 10 \log \frac{I}{Io}$$

(5)

$$db = 10 \log \frac{(p^2)}{(po^2)} = 20 \log \frac{p}{po}$$

The decibel, which is one-tenth of a bel, can thus be defined as a dimensionless, logarithmic ratio comparing two power values. In equation No. 5 po represents the pressure refence level which, in all measring instruments approved by the American Standards Association, is 0.0002 dynes/cm².

It will be readily seen that by substituting a pressure of 20 dynes per sq. in. in this equation a decibel value of 100 will be obtained. A doubling of the sound intensity will only increase the decibel value by 3 decibels. This can easily be established by substituting the value 2 in equation (4).

Since all of us here are primarily interested in noise control in industry we might offer the general definition of noise as an undesirable sound. The main reason why noise in industry is undesirable is because the one definitely established effect of noise above a certain level is that it can cause deafness, other factors like speech interference and resulting accidents; effects on nervous system are less well established.

However, whatever the underlying medical or economic cause of industrial noise control work is, its essential purpose is to prevent the creation of a noise or, if the noise cannot be eliminated, to confine its radiation within certain well defined limits. We will first briefly discuss noise control at the source and then mainly concern ourselves here with the basic theory and engineering methods involved in controlling noise which cannot be eliminated at the source.

Control At Source

Noise control at the source represents, of course, the ideal solution of the problem. However, this is largely the task of the manufacturer who with the help of acoustical engineers can redesign his equipment. This in many cases may be either impossible or very costly. Nevertheless a few general ideas can be advanced here.

A certain amount of experimentation has lately been carried out in the use of metals such as copper manganese which has good damping characteristics and reasonable mechanical strength. Impact noises can be reduced to some extent by the employment of softer metals where conditions permit. Mild steel, for instance, is quieter to work with than stainless steel. Copper, brass and aluminum can be expected to produce less impact noise than steel. Some time in the future it is conceivable that certain types of metal shaping and forming machines which, at the present time, work metal by exerting powerful impact blows, can be replaced by hydraulically operated pressure devices.

Another possibility lies in the fact that the human ear is sensitive to a definite range of frequencies; that is, generally speaking, from 16 to 20,000 cps. If machinery can be designed where the periodic pressure fluctuations lie in the ultrasonic range, this would perhaps be a solution for certain types of machines.

A dog whistle is one example of what is possible; the higher hearing limit of a dog is higher than that of a human being and the dog can therefore hear sounds which a human being cannot hear. However, R. O. Fehr points out that in some operations it may probably never be possible to silence a machine by redesign. An aircraft jet engine is an outstanding example.

F. G. Tyzzer in the *Industrial Hygiene Quarterly*, Dec., 1953, has summarized a few measures for the noise conscious production engineer:

a) Welding instead of riveting.

b) Compression riveting instead of common pneumatic riveting.

c) Pressing or rolling instead of forging.

d) Grinding instead of chipping castings and welded joints.

e) Electrically operated instead of unquieted pneumatic tools.

f) Selection of less noisy types of conveyors.

g) Avoidance of dropping hard materials during handling.

h) Mechanical stripping of work from dies instead of air blast stripping.

i) Low speed process machinery instead of high speed machinery.

j) Substitution of materials; for example, fabrication of plastics is usually less noisy than sheet metal fabrication.

k) Wide spacing between banks or rows of noisy machines instead of close spacing.

l) Hot working of metals instead of cold working.

m) Belt drives instead of noisy gears.

n) Substitution of less noisy materials used in friction processes as in brakes and clutches.

Sound-Absorbing Materials

If none of the above solutions are practicable, it would be wise to investigate the possibility of using sound-absorbing materials.

A material is sound absorbing by virtue of its porosity. Many materials such as fiberglas, mineral wool, pads and blankets have a multitude of small, deeply penetrating intercommunicating pores. The sound waves which propagate through these pores are converted into heat by frictional and viscous resistance within the pores, as well as by vibration of the small fibers of the material. As much as 95% of the incident energy may be absorbed in this manner.

Most such materials have better absorption characteristics in the higher frequency bands than in the lower frequencies. Low frequency absorption, however, can be improved by increasing the thickness of the porous material.

A large number of commercial materials, most of them though intended for architectural applications, are on the market, and their acoustic characteristics are available. In industrial applications the method of application is usually more important than the material itself.

The noise reduction obtainable by absorptive materials can be readily calculated using the following equation:

(6)

$$\text{Noise Reduction} = 10 \log \frac{A_1 + A}{A_1}$$

where A = total number of square foot units (sabins) of added absorption treatment.

A_1 = total number of square foot units (sabins) of absorption before treatment.

Thus if the absorption is doubled, the average noise level will be decreased by three decibels.

Absorption in rooms is measured in terms of the sabin, which is the product of the surface area and its absorption coefficient. The absorption characteristics of a material depend on its frequency.

The absorption coefficients of a typical 4" thick industrial acoustic panel are as follows:

Frequency Cycles/sec.	Sound Absorption Coefficeint
128	0.66
256	0.99
512	0.98
1024	0.94
2048	0.93
4096	0.88
N.R.C.	0.95

The Noise Reduction Coefficient is the average of the absorption coefficients of 256, 512, 1024 and 2048 cycles per second to the nearest multiple of 0.05. It is usual to use the noise reduction coefficient in the above equation.

Typical Calculation

For example, a factory area measuring 80 ft. x 100 ft. x 18 ft. high amounts to a total surface area of 22,400 sq. ft. If an average absorption coefficient of 0.05 is used, the total absorption of this area will be 1320 sabins.

If we now treat the ceiling area with functional sound-absorbers having a Noise Reduction Coefficient of 0.75, we add 8000 x 0.75 equals 6000 sabins of absorption. The reduction of the diffused noise level then is

$$R = 10 \log \frac{1320 + 6000}{1320} = 10 \log 5.55$$

or approximately 7 decibels.

The noise which the worker hears consists of direct sound and reverberant sound. It is obvious that application of sound absorbent materials to the ceiling will only reduce the reverberant sound and not the direct sound for the men close to the noisy machine. The worker on a noisy machine will therefore receive hardly any benefit at all from such acoustic treatment whereas the workers further away from the noise maker will obtain increasing benefits.

(See INDUSTRIAL NOISE on next page)

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Do you know who manufactures the various important components of the hearing aids you sell?

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No magnetic microphone now available can match the quality of our new 71 B line. Just listen to one and hear for yourself, and then ask your manufacturer if he can supply instruments to you with TIBBETTS microphones — or perhaps he already does!

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INDUSTRIAL NOISE

(Con't. from preceding page)

In summary it can be said that acoustic ceiling treatment is valuable where the noise levels are not too high and where a noise reduction at a distance away from the noise maker is required. It certainly has a certain psychological effect even if the actual noise reduction is not very large. If it is necessary to reduce the noise for the operator close to a noisy machine more elaborate measures will be required, which will be discussed next.

Of course most noise problems could be solved if it were possible to place a solid wall between the noisy machine and the operator. Since this is possible in a limited number of applications, especially where the operation of the equipment is completely automatic, it is useful to examine the isolating characteristics of solid partitions in some detail.

The noise transmission loss thru a solid airtight partition is governed by what is known as the mass law. Theoretical investigation leads to the following equation showing that the transmission loss varies directly with the logarithmic of the mass and frequency.

(7)

$$R = 20 \log \frac{53.5}{10^6} Gf$$

where G = Mass of partition kg/m²
f = frequency in cycles/sec.

It will be noted that for each doubling of the weight and for each doubling of the frequency the noise reduction through the wall is increased by six decibels.

When sound is transmitted through a solid wall, the incident sound wave 1 will be partially absorbed by the absorbent material and partially transmitted through the wall. A/I, the ratio of transmitted sound over incident sound, defines the transmission coefficient T.

At this point the difference between sound absorption and transmission loss must be emphasized. The transmission coefficient for a light acoustic tile weighing say ¾ lbs. sq. ft. is about 1% whereas an 8″ brick wall weighing about 80 lbs. sq. ft. has a transmission coefficient of about one thousandth of one per cent. In terms of actual noise reduction in decibels there will be approximately a 10 db internal noise reduction due to the acoustic lining and 50 db external noise reduction due to the brick wall. A porous sound absorbent material alone actually makes a poor sound barrier.

London goes on to treat the case of a soundproof room in order to show why the combined use of sound-absorbent materials and a solid airtight partition is required.

A room is immersed in a sound field of sound level L_1. Sound level L_2 exists in the interior as a result of the absorption and sound transmission characteristic of the room.

$$\text{Noise Reduction} = L_1 - L_2 = 10 \log \frac{as + rs}{TS}$$

An interesting fact is that if there is no absorption inside the room there will be no sound reduction at all, because sound pressure inside and outside the room will tend to equalize over a period of time. This is a very important point to bear in mind in building soundproof rooms, even if this analysis is only entirely correct under idealized conditions.

If the opening of the aperture is large compared with the wave length, practically the whole of the impacting sound will be transmitted through the opening. If the aperture is small, then sound penetration will depend on the opening's form and the thickness of the wall.

The theoretical evaluation of an opening in a soundproof enclosure is rather complex. The actual sound energy lost through the aperture will very much depend on the location of the sound source in relation to the opening and the acoustic characteristics of the walls.

Total enclosures with special silencing devices represent the most effective means of reducing industrial noise. However, they are also an expensive method of treatment. Good results can be obtained with partial enclosures . . . though the results will be largely directional, limited reductions being obtained in the acoustic shadow zone of the partition. Such applications, like most acoustic noise control applications, can be useful if properly designed and installed.

The reduction of noises caused by airflow through a duct, pipe, tunnel or orifice is fairly well understood. Commercial silencers are available for most noise problems of this type.

Ear Protection

Earplugs giving as much as 20 db reduction are available. Cotton-wool, though widely used, is actually quite ineffective, particularly in the lower frequencies.

Many people find earplugs uncomfortable, though this objection could perhaps be overcome by individually fitting plugs. Other objections are that earplugs are difficult to keep clean, easy to lose, and sometimes make communication by speech difficult.

Where noise levels exceed 125 db, helmets are sometimes employed in order to protect against noise transmission through the bone structure. In this connection, the advisability of conducting hearing tests by means of an audiometer on prospective employees in noisy locations might be mentioned. This would afford a certain amount of protection to industry in cases where deafness compensation claims arise.

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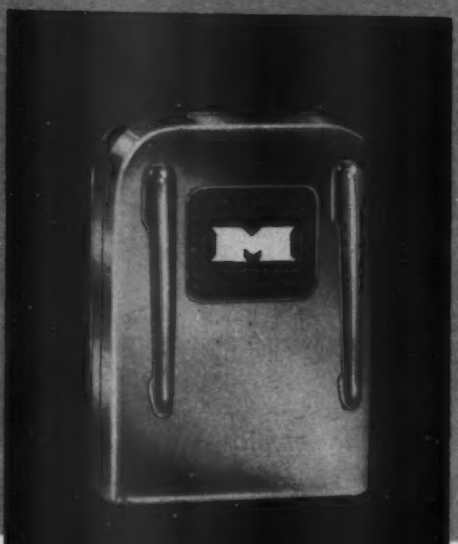

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